25X1

Directorate of Intelligence

Secret

Soviet Efforts To Modernize Steel Production: Dependence on Western Equipment

25X1

An Intelligence Assessment

Secret

SOV 84-10134X
August 1984

Copy 478

Page Denied

 25X1

Directorate of
Intelligence

Secret [redacted]

Soviet Efforts To Modernize Steel Production: Dependence on Western Equipment [redacted]

25X1

An Intelligence Assessment

This assessment was prepared by [redacted] of the Office of Soviet Analysis, with a contribution by [redacted]
Comments and queries are welcome and may be directed to the Chief, Soviet Economy Division, SOVA, [redacted]

25X1
25X1
25X1

Secret
SOV 84-10134X
August 1984

[redacted] 25X1

Soviet Efforts To Modernize Steel Production: Dependence on Western Equipment [redacted] 25X1

Key Judgments

Information available as of 30 June 1984 was used in this report.

The Soviets are modernizing their steel industry with the help of Western equipment and technology. The USSR is the world's largest producer of crude steel and rolled steel products, but steel production faltered in the late 1970s and early 1980s. More important, the quality and assortment of steel products have not kept pace with demand, and the Soviets have become increasingly dependent on imports, primarily from the West, for many types of steel products. [redacted] 25X1

The modernization effort is concentrated at two major facilities—the Novyy Lipetsk and Oskol steel complexes. Two new cold-rolling mills are being built at Novyy Lipetsk, and an entire steel complex is under construction at Oskol. In addition, a minimill is being built at Zhlobin using Western technology and equipment. [redacted] 25X1

These three complexes, when completed, will improve the quality and assortment of steel products, lessen raw material requirements, and reduce the need for imports of many rolled steel products:

- The Novyy Lipetsk facilities will produce annually 480,000 metric tons of dynamo steel and 2.5 million tons of sheet and strip, including 500,000 tons of galvanized sheet. The Soviets report that the first stage of the Oskol complex is expected to produce annually over a million tons of rolled steel, and the Zhlobin minimill will add 500,000 tons a year of bars, rods, and sections.

- The direct-reduction process that will be used at Oskol uses no coking coal and little scrap—resources that are in short supply in the Soviet Union. It will, however, require a steady supply of iron ore.

- The Soviets will be able to reduce, if not eliminate, purchases of many types of Western steel. [redacted] 25X1

A consortium that includes the Soviet Union, Japan, West Germany, France, and Austria is building a rolling mill at Novyy Lipetsk, which we believe probably will reach full-capacity production in late 1984 or early 1985. The mill will increase Soviet cold-rolled sheet and strip production by about 25 percent and galvanized sheet production by almost 70 percent. Although Soviet press reports claim that this output will be used in the manufacture of automobiles, we judge that some of it may be used in the production of military vehicles. [redacted] 25X1

25X1

France is supplying a second rolling mill at Novyy Lipetsk, which is designed to produce dynamo steel sheet. When full-capacity production is reached, probably in the late 1980s, this plant will increase Soviet dynamo sheet output by about 50 percent. Dynamo steel sheet—an electrical-grade steel with properties that limit energy loss—is used in the electric power industry and has some military applications, such as in motors for military ships and tanks. 25X1

The Oskol complex is being built with West German assistance and will use the direct-reduction process, which eliminates use of the blast furnace. We expect the first stage of the complex to begin full operation in late 1985, and the production probably will be used in construction and machine building. Over the next decade, the Soviets plan to build additional facilities for the output of sections and plates—products that have a variety of uses. Because of the high quality of steel produced using the direct-reduction process, some of the complex's output probably will be used in production of armored vehicles and military ships. 25X1

The Zhlobin minimill is being supplied by Austria and Italy. It probably will reach full capacity in late 1985 and will produce bars, rods, and sections for use in construction and machine building. 25X1

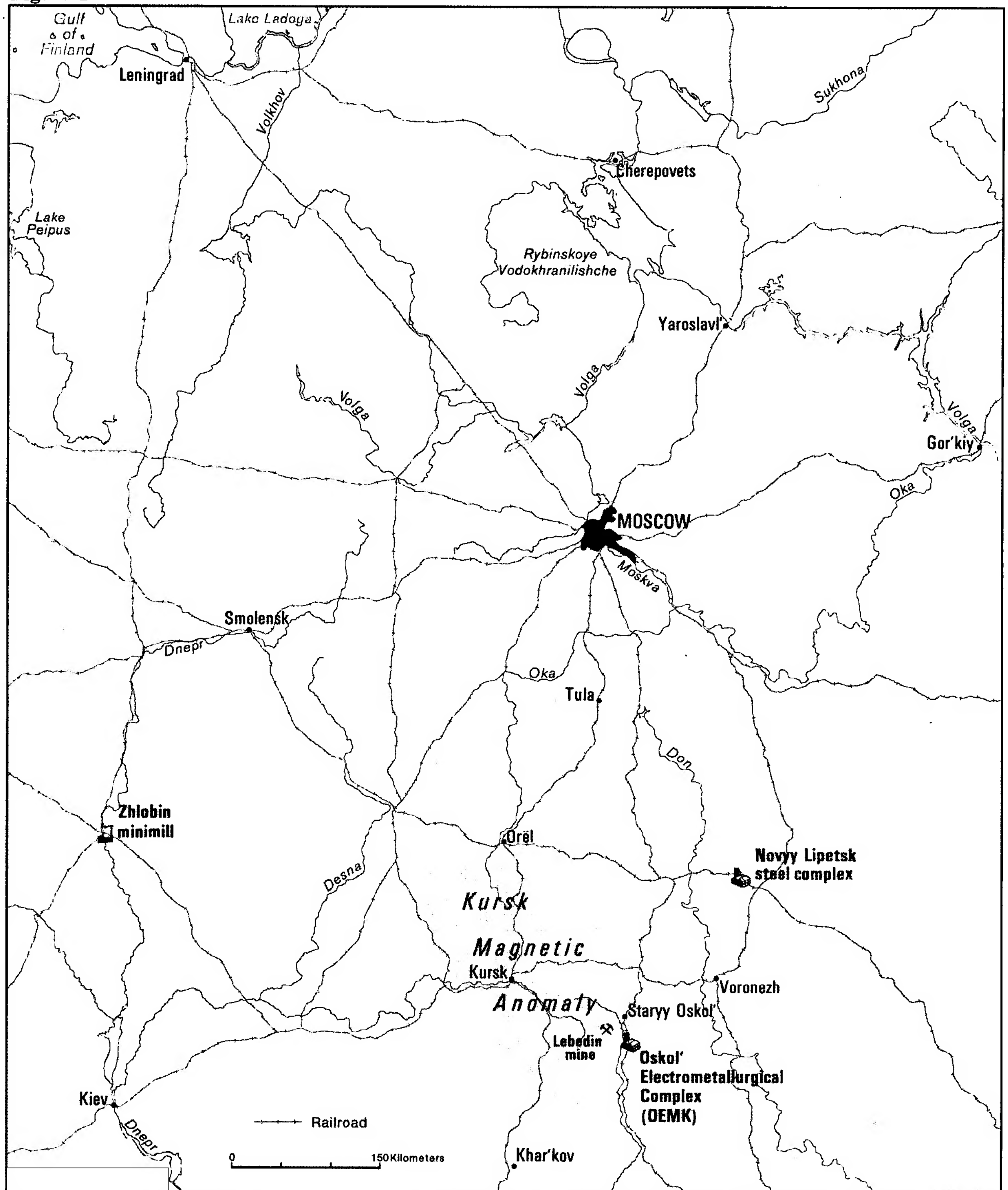
The assimilation of Western technology in these three complexes will facilitate production of high-quality steel using processes that would have otherwise taken the USSR years to develop. However, the Soviets will need years of developmental work to duplicate much of this technology for use in additional plants. 25X1

Contents

Approved For Release 2009/08/03 : CIA-RDP85T00313R000200110007-3

25X1

Figure 1



702959 (546609) 8-84

25X1

 25X1

Soviet Efforts To Modernize Steel Production: Dependence on Western Equipment

25X1

Introduction

The USSR is the world's largest producer of crude steel and rolled steel products. In 1983 it produced 153 million tons of crude steel and 107 million tons of rolled steel. The United States, by comparison, last year produced 76 million tons of crude steel and 61 million tons of steel mill products.

25X1

With the backing of a leadership determined to support a broad range of ambitious military and industrial programs, crude steel production grew without interruption during 1951-75. Annual increments were steady, averaging about 4 million tons in the 1950s and about 5 million tons from 1960 through 1975.

25X1

Table 1
Total Soviet Steel Imports

Million US $

	1970	1975	1980	1981	1982
Total	**568**	**3,197**	**4,335**	**4,263**	**5,049**
Rolled steel	289	1,356	2,428	2,071	2,055
Pipe	279	1,841	1,907	2,192	2,994

Source: *Vneshnyaya torgovlya* (annual issues)

25X1

However, steel production faltered in the late 1970s and early 1980s. Crude steel output in 1983 was only 1 million tons above the previous peak level of 152 million tons in 1978. More important, the quality and assortment of steel products have not kept pace with demand, and the Soviets have become increasingly dependent on imports, primarily from the West, for many types of steel products. In 1970 the USSR imported about $600 million worth of rolled steel products and pipe, of which 52 percent was from Western countries; by 1982 this figure had increased to over $5 billion, 83 percent from the West (see table 1).

The main cause of the recent poor performance of the Soviet steel industry is inadequate past investment in all sectors of the industry—from mining to rolling and finishing steel products.[1] Additionally, Soviet rolling and finishing technology has lagged that of Western countries, resulting in lower quality products. To help overcome these problems, the USSR plans to invest almost one-third more in the steel industry in 1981-85 than it did in 1976-80.

To reduce dependence on imports of Western steel and to help modernize their steel industry, the Soviets have sought Western steelmaking equipment and technology. Since 1975, Moscow has spent at least $2 billion on imports of technology and equipment—primarily from West Germany, France, Italy, and Japan. About one-half of these expenditures have been earmarked for the Novyy Lipetsk and Oskol steel complexes. Two new cold-rolling mills are in the works at Novyy Lipetsk, and a whole new steel complex is planned at Oskol. In addition, a minimill is being built at Zhlobin by Austrian and Italian firms. Completion of these plants is critical to future Soviet steel production. This report describes Soviet efforts to develop these three complexes with the help of Western equipment and technology, discusses the prospects for their completion, and assesses their potential impact on the Soviet steel industry and economy.

25X1

25X1

25X1

Novyy Lipetsk Steel Complex

The steel complex in Novyy Lipetsk is a large, fully integrated facility. It began operation in 1934 but was destroyed during World War II. Reconstruction began in 1949, and by 1951 the complex was operating again. Major facilities include:

- A sinter plant.
- A coke plant.
- Six blast furnaces.
- Two basic oxygen furnace shops.
- An electric furnace shop.
- Continuous casting machines.
- Hot- and cold-rolling mills.
- A control computer center.

The Novyy Lipetsk complex was the first in the world to use the continuous casting process exclusively and is the largest facility of its kind in the world.[2] The Soviets report that current production from Novyy Lipetsk includes about 11 million tons of pig iron, 9 million tons of crude steel, and nearly 7 million tons of rolled steel. The complex ranks third in the USSR in crude steel production and fifth in rolled steel production. Rolled steel products include flat sheet and hot-rolled strip produced in coils. The flat sheet is used in the construction, automobile, shipbuilding, and electrical industries. The coils are shipped to the Urals and southern USSR for the production of large-diameter pipe for use in gas pipelines.

the Novyy Lipetsk complex has an odd mixture of modern and obsolete steelmaking methods and equipment. Much of the equipment used in the initial processes of steelmaking—coking, sintering, and smelting—is modern and principally of Soviet, West German, and French manufacture. The continuous casting machines are of Soviet and West German design. In the past, some functions of the Soviet-made continuous casting machines were poorly designed and, consequently, lowered the surface quality of steel produced at Novyy Lipetsk. New Soviet casters are now producing higher quality steel.[3] The laboratory equipment and instruments used in chemical analysis are US-made and of recent manufacture. The Soviet computers—although big and unsophisticated—perform the required functions well. However, the complex lacks high-quality steel strip and sheet mills and finishing processes. 25X1

The Soviets have been continually expanding and modernizing the Novyy Lipetsk complex. Since 1974, it has more than doubled its crude steel production—from 4 to 9 million tons. However, the Soviets realized that they could not substantially improve the quality of their steel products without Western assistance. Therefore, they now are building—with foreign assistance—two new cold-rolling mills at Novyy Lipetsk that will increase the quality and assortment of steel strip and sheet. 25X1 25X1

Sheet Mill

An international consortium comprising the USSR, Japan, West Germany, France, and Austria is building a cold-rolling mill at Novyy Lipetsk that will produce steel strip, sheet, and galvanized sheet. The Soviets are responsible for the preliminary processing of the steel. They are supplying the continuous casting equipment, which will be fed by crude steel produced at Novyy Lipetsk. The Soviets are trying to resolve their deficiencies in the quantity and quality of sheet production in a single stroke by bringing in the best technology for this internationally built mill (see table 2).[4] 25X1 25X1 25X1

The cold-rolling plant will produce thin, low-carbon sheet and strip with a thickness of 0.5 mm to 2.5 mm. Some of these sheets will be galvanized—a process whereby a thin zinc coating is applied to the steel sheet to provide protection against corrosion (see figure 2). The rolling mill is designed for an annual

[2] In a continuous casting operation, molten steel is poured directly from the steel ladles into open-ended, water-cooled molds in which the molten steel solidifies from the outer, cooled surfaces and is cast directly into a slab, bloom, or billet. This process, which is widely used in the industrialized West, saves energy and labor and increases both the efficiency of the steelmaking process and the quality of products.

[3] Indeed, the USSR is one of the world's leaders in continuous casting technology. Many continuous casting machines in Western plants are based on original Soviet designs. Moreover, the Soviets have sold their equipment and technology to companies in over 30 countries, including Japan's Nissan and Kobe Steel Companies and Italy's Terni steel plant. 25X1

[4] Soviet cold-rolling technology is less advanced than that of the West. As a result, the thickness of Soviet steel sheet has been more uneven and, for comparable applications, the average thickness greater than in the West. 25X1

25X1

25X1

Table 2
USSR: Purchases of Western Equipment and Technology for Novyy Lipetsk Cold-Rolling Sheet Mill

Year Contract Was Signed	Supplier	Equipment and Purpose	Value *(million US $)*
1976	Schloemann-Siemag and Siemens, West Germany	Continuous five-strand tandem cold-rolling mill with capacity of 2.5 million metric tons per annum (tpa) of low-carbon sheet and strip steel.	98
	Schloemann-Siemag and Siemens, West Germany; Rutner Industrie-Anlagen, Austria	Two high-capacity pickling lines for steel strip. Joint capacity of 4.5 million tpa.	50
	Nippon Kokan, Japan	Equipment for continuous annealing of cold-rolled steel sheets by the Nkk-Cal process, capacity of 500,000 tpa.	52
1978	Nippon Steel, Japan	Continuous galvanizing line for sheet steel. Capacity of 500,000 tpa.	NA
	Creusot-Loire, France	Carbon steel longitudinal and transverse cutting line for steel strips and sheets, and lines to make steel bracing strip.	22

[redacted] 25X1

25X1

output of 2.5 million tons of sheet and strip, including 500,000 tons of galvanized sheet. The Soviets are purchasing Japanese galvanizing equipment and technology for it.[5] When the plant reaches full capacity, Soviet cold-rolled sheet and strip production will increase by about 25 percent and galvanized sheet production by almost 70 percent. [redacted]

[redacted] construction of this cold-rolling mill began in the mid-1970s [redacted] The mill was externally completed by February 1981, and three additions have since been built. [redacted] most of the equipment for the mill has been installed and that some sheet production has occurred. However, parts of the project—under the direction of the Nippon Kokan Company of Japan and Creusot-Loire of France—have not gone well, and replacements for some Japanese equipment had to be ordered during 1983. Given the problems and delays, full-capacity production at this mill probably will not be reached until late 1984 or early 1985. [redacted] 25X1

Additional capacity will probably be added to this mill in the future. As of 1983, the Soviets also were accepting bids from Western firms for an electrical galvanizing line and a color-coating line. [redacted] 25X1

25X1

25X1

25X1

Dynamo Steel Mill

The second new cold-rolling mill being built at Novyy Lipetsk will increase Soviet output of dynamo steel sheet by about 50 percent.[6] Under the original contract for the mill, Armco Steel Corporation of the

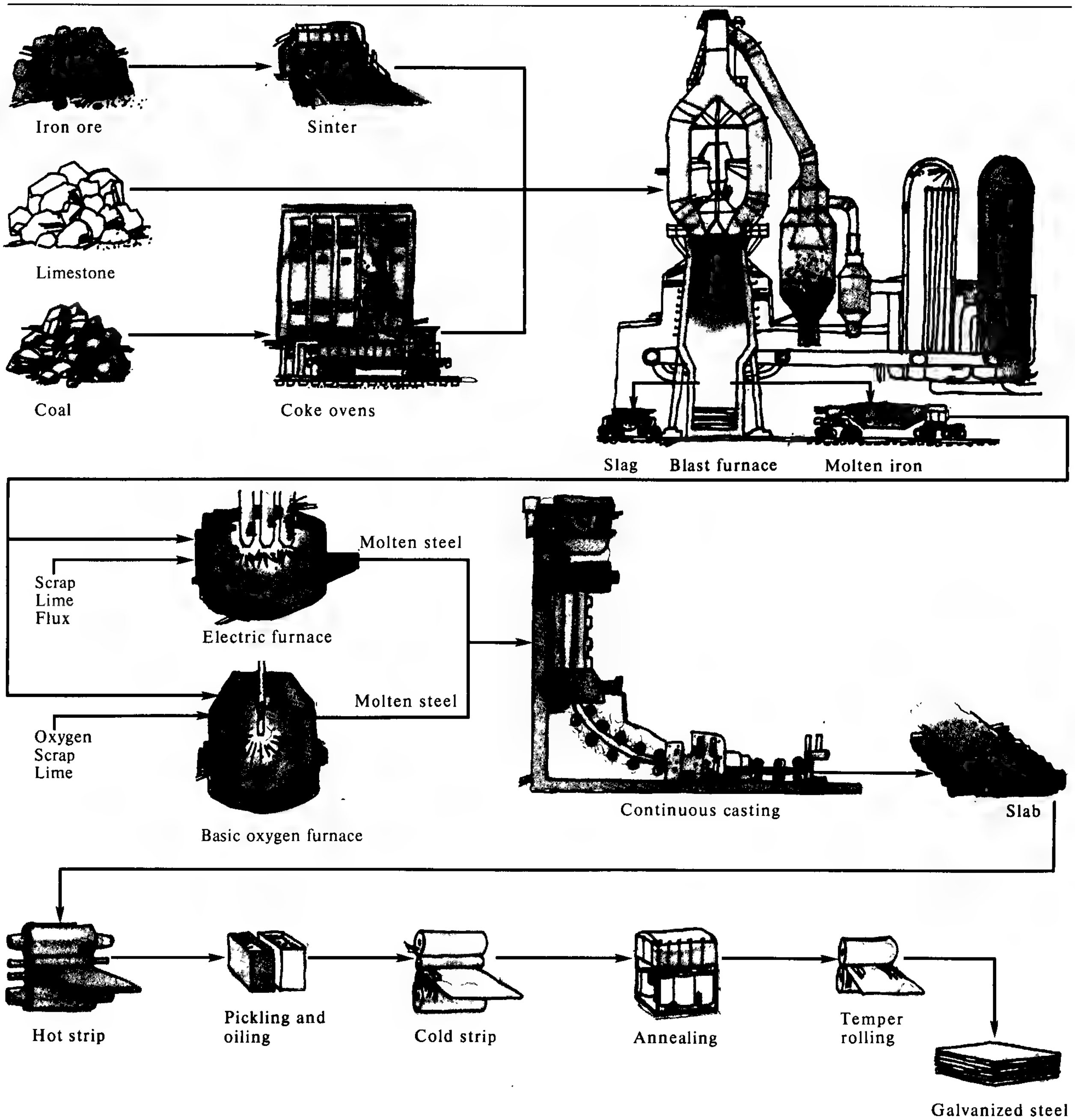
[5] Soviet galvanizing technology also has lagged that of the West. The first continuous line for zinc coating was introduced in the Soviet Union in 1964, using Austrian equipment and technology. At that time there were already 50 such lines in the United States and 21 in Japan. Because the Soviets have done less developmental work and have less experience with coating technology, they probably would be unable to produce quality galvanized steel sheet without foreign assistance. [redacted]

[6] Dynamo steel is an electrical-grade steel with properties that limit energy loss. Although the USSR now operates some cold-rolling dynamo plants, [redacted] the Soviets lack the technology needed to ensure an even distribution of the magnetic properties during the rolling process—the critical element for high-quality electric sheet production. [redacted] 25X1

25X1

25X1

Figure 2
Sheet Production Process at Novyy Lipetsk



25X1

303308 8-84

Page Denied

United States was to supply the technology, laboratory testing equipment, and general engineering skills, and Nippon Steel Corporation of Japan was to provide the equipment. Both firms were prevented from carrying out their contract when US sanctions were imposed in early 1980 after the Afghanistan invasion, however, and the Creusot-Loire Group of France was awarded the contract in September 1980. [redacted]

We believe the French contract is essentially the same as the original US-Japanese contract, [redacted] current production of electrical steel, including dynamo steel, is 1 million tons. Under a contract worth $350 million, Creusot-Loire will provide the Soviets with:

- A tandem cold-rolling mill.
- Twenty-four processing lines, including 11 continuous annealing lines and lines for pickling, heat flattening, slitting, and coating.
- Support equipment.

The existing facilities at Novyy Lipetsk will be used for preliminary processing—the melting, continuous casting, and hot rolling—of the steel that will supply this mill. [redacted]

Creusot-Loire probably is also supplying most of the technology for the mill. When the United States and Japan withdrew from the project, the Soviets claimed they had developed the needed technology to produce high-quality dynamo steel without foreign assistance. [redacted]

The US and Japanese withdrawal from the project has delayed plant construction. [redacted] initial groundwork for new construction was under way in the rolling mill section of the complex in June 1982. By September 1983, footings were being constructed for what is probably the dynamo plant. We estimate that construction will not be finished before 1985 and that full-capacity sheet production will not be reached until the late 1980s at the earliest. [redacted]

Direct-Reduction Production Process at Oskol

In the direct-reduction process to be used at Oskol, concentrated iron ore pellets are reduced to sponge-iron pellets, with an iron content of 90 to 95 percent, using natural gas as the reducing fuel. The pellets, together with scrap, are converted to steel in an electric furnace. This process eliminates the need for coking coal and blast furnaces because the intermediate product, pig iron, is not required. Steel smelted by this process has better technical and mechanical properties than steel produced using pig iron and steel scrap. [redacted]

25X1
25X1
25X1
25X1

Oskol Electrometallurgical Complex

The Oskol Electrometallurgical Complex (OEMK), located near Staryy Oskol, is planned around the huge iron ore basin known as the Kursk Magnetic Anomaly (KMA).[7] According to a Soviet technical journal, the steelmaking production chain will start at the Lebedin mine in the KMA, where iron ore is currently mined. The ore will be concentrated and transported through a 27-kilometer ore slurry pipeline to the OEMK. [redacted] 25X1 25X1

The Oskol complex will be the only plant in the USSR using direct-reduction technology and will be one of the largest plants of its kind in the world (see inset). According to a Soviet journal, the USSR decided to purchase Midrex direct-reduction technology because of the corporation's experience in the operation of existing installations in West Germany, Canada, and the United States; the advanced development of the technology and equipment; and the comparatively large unit capacity of the installations.[8] The few 25X1 25X1

[7] [redacted] the KMA has estimated reserves of 16.7 billion metric tons—roughly 26 percent of total Soviet iron ore reserves. We estimate current annual KMA production of iron ore at over 40 million metric tons. Because of a lack of local metallurgical facilities, ore from the KMA is transported to various plants beyond its boundaries. [redacted] 25X1 25X1 25X1

[8] The Soviets obtained a license for the technology in 1975 from Midrex Corporation of the United States. At that time, Midrex was a subsidiary of Korf Industries, Inc., of West Germany. [redacted] 25X1 25X1

25X1

Western firms that dominate the market have invested substantial capital and development work in this process, and most of the technology is considered proprietary information. Therefore, the Soviets probably will save time by importing direct-reduction technology for assimilation at the Oskol complex rather than waiting for development of their own.

The West Germans are providing most of the equipment and technology for the Oskol complex The continuous casting technology will be based on Soviet engineering designs and West German equipment. The complex will be highly automated. The Soviets report that all the operating processes of the section rolling mills, beginning with the storage of semifinished steel and ending with the binding of bundles of finished rolled product, will be marked by a high level of automation. ASEA of Sweden is providing computer and control technology for the steelmaking plant and probably the rolling mills. The Soviets insisted that ASEA buy Soviet computers for incorporation into the steel plant.

The first stage of the steel complex is being built in three phases:

- Pelletizing and direct-reduction plants.
- Steelmaking and continuous casting plants.
- Rolling mill.

According to a Soviet journal, the first stage is designed for an annual output of 2-2.5 million tons of iron pellets, 1.7 million tons of sponge-iron pellets, and 1.5 million tons of structural, alloy, and bearing steel. The Soviets report that annual output from the West German–built rolling mill is planned at 1.2 million tons of sections and semifinished pipe 50 to 180 mm in diameter.[9]

25X1

25X1

25X1

25X1

[9] Steel sections consist of structural steel and steel bars. Structural steel includes large beams and angles. Bars resemble structural shapes but are smaller. They are shaped in the form of rounds, I-beams, and angles A Soviet journal reports that round, square, hexagonal, and flat bars will be produced at this rolling mill. Semifinished pipe probably refers to round bars or billets that are later formed into seamless pipes at piercing mills.

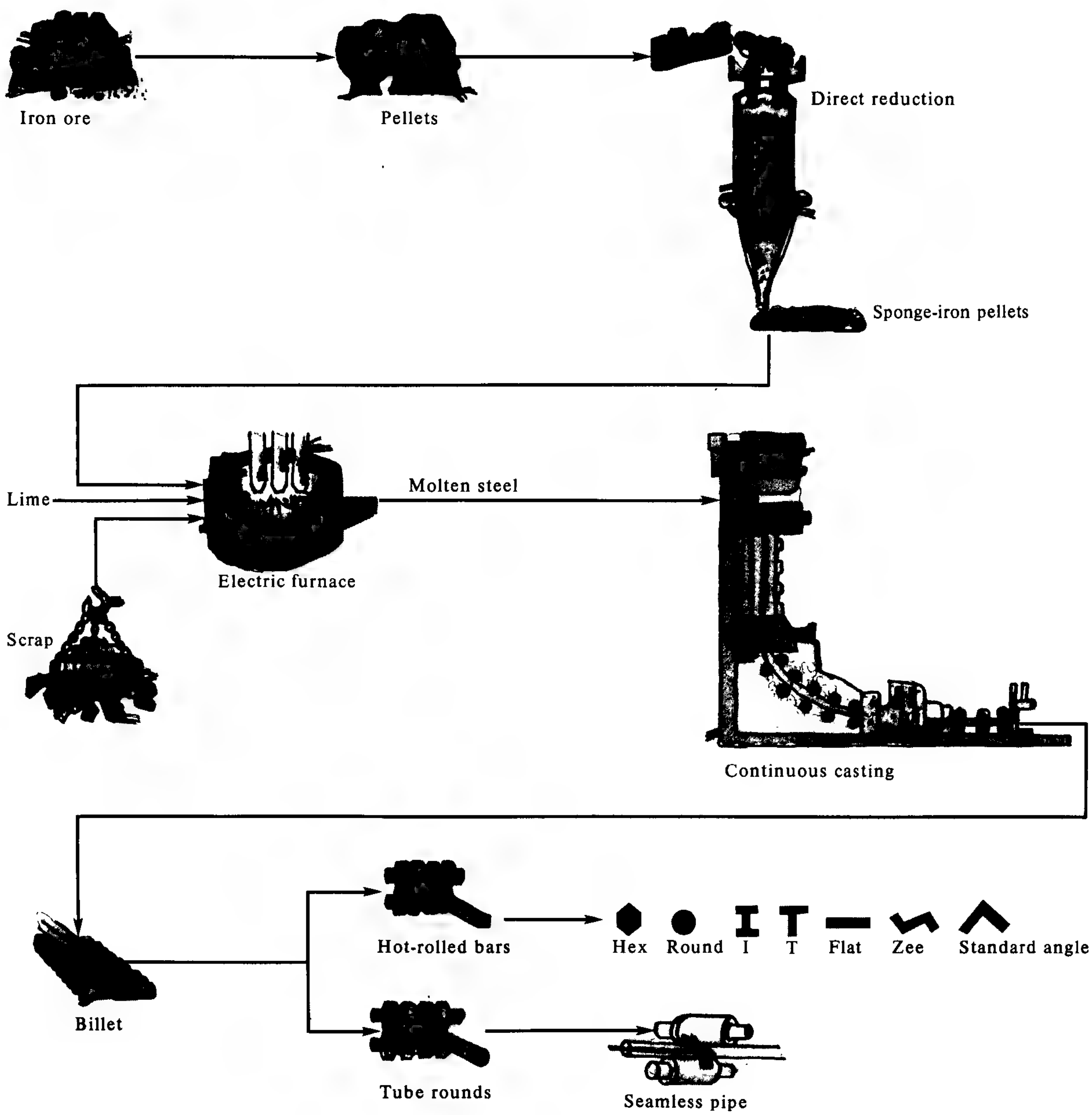
25X1

25X1

25X1

25X1

Figure 4
Section Production Process at Oskol' Electrometallurgical Complex



25X1

303310 8-84

25X1

25X1

The first stage of the Oskol steel complex has been under construction since the late 1970s. The Soviets report that the facilities are several years behind schedule. Labor resources were diverted from the construction of the Oskol complex to help prepare for the 1980 Olympic games. As a result, the Soviets were forced to put many of the plant components into storage when they were delivered.

25X1

At that time, only the pellet plant appeared to be in trial production. Additionally, a possible iron ore slurry pipeline was under construction at the complex in late 1983. At the current rate of construction, we estimate it will be about two years before all production facilities in the first stage begin operating.

25X1

25X1

25X1

25X1

Table 4
USSR: Construction Chronology of the Oskol Electrometallurgical Complex

Facility	1978 August	1980 September	1981 February	1982 September	1983 July	1983 December
Pellet plant	O	U	U	U	X	OP
Direct-reduction plant	O	U	U	U	U	U
Electric furnace building	O	O	U	U	U	U
Rolling mill	O	O	O	U	U	U
Administration buildings	U	U	U	X	X	X
Steam plant	U	U	U	U	X	X

OP—facility operating.
X—facility externally complete.
U—facility under construction.
O—facility not present.

[redacted] 25X1

The Soviets report that two more construction stages are planned for the Oskol complex. During the second stage, they plan to add:

- One or two additional plants for producing iron pellets.
- Six or eight Midrex direct-reduction installations that will increase annual sponge-iron pellet production to 5-5.4 million tons.
- An expansion of the electric steelmaking and continuous casting shop that will increase crude steel capacity to 2.4 million tons.
- Two mills that will produce a wide assortment of sections.
- A plant for finishing 1.8 million tons of rolled section a year. [redacted]

In the third and final stage, current Soviet plans call for a new electric steelmaking and continuous casting shop and a rolling mill to produce plate with a thickness of 5 to 40 mm. The mill's designed annual capacity is 1.6 million tons. [redacted]

The additional construction probably will involve foreign participation, but [redacted]

The Soviets' past construction record suggests these stages will take at least seven to 10 years to complete. [redacted]

Zhlobin Minimill

In 1982 the Soviets signed a contract for $540 million with Voest-Alpine AG of Austria and Danieli S. p. A. of Italy to build a minimill at Zhlobin.[10] The mill will consist of two electric arc furnaces with a designed annual capacity of 750,000 tons of crude steel, a continuous caster, and a combined bar, rod, and section rolling facility with a capacity of 500,000 tons per year. Much of the equipment for this mill is to be supplied by Western subcontractors. [redacted] 25X1 25X1

[redacted] the mill was in the middle stages of construction in late 1983. It will probably start production in early 1985. [redacted] 25X1

[10] For Soviet planners who have developed the steel industry around concentrations of production facilities, the concept of building minimills is new. A typical minimill contains electric steelmaking, continuous casting, and rolling facilities. Annual production capacity is usually between 50,000 and 500,000 tons of rolled steel but can be as high as 1 million tons. In addition to Zhlobin, the Soviets are building two minimills in Moldavia and Komsomol'sk, but these minimills probably will be indigenously equipped. [redacted] 25X1

25X1

25X1

25X1

25X1

25X1

 25X1

Impact

When these projects are completed, they will have a large impact on both the Soviet steel industry and the economy in general. These effects include:

- Improvement in the amount, quality, and assortment of steel products.
- Hard currency savings from reduced steel imports.
- Reduced requirements of Soviet scrap and coking coal supplies. [redacted]

End Uses

The Soviet Union has lagged considerably behind Western steelmaking countries in the production of high-quality cold-rolled sheet. [redacted] shortages of steel sheet for the automobile industry and of magnetic steel sheet for the electric power industry. The two rolling mills being built at Novyy Lipetsk should help alleviate these shortages. [redacted]

The Soviets report that the steel sheet produced from the internationally built rolling mill at Novyy Lipetsk will be used in the production of automobiles, trucks, and agricultural machinery. Galvanized sheet is particularly useful for the underbody parts of vehicles. The zinc coating provides protection against salt and helps prolong the life of vehicles.[11] [redacted]

The Soviets report that the Volga automobile plant will be the main customer of both the galvanized and uncoated steel sheet from Novyy Lipetsk. [redacted] automobiles and jeep-type vehicles are produced at the Volga plant. [redacted] small trucks also may be produced there in the future. Both galvanized and uncoated steel sheet are used in the production of all three vehicles, many of which may be used by the military. [redacted] an armored vehicle plant may be located at Volga. Uncoated steel sheet is used in the production of armored vehicles. [redacted]

[11] Galvanized steel sheet has been used by US automakers since the mid-1970s because of increased levels of road salt in this country. The Zinc Institute, Inc., estimates that the average US car model in 1983 contained 273 pounds of galvanized steel. The increased use of galvanized steel in the United States has allowed domestic automakers to offer warranties of three to five years on some car models. [redacted]

Dynamo steel sheet, to be produced at the French-built rolling mill at Novyy Lipetsk, is used in the production of electric motors, generators, and dynamos—primarily for use in the electric power industry. Some grades of dynamo steel have applications in motors for military ships and tanks, but we do not know how much of the production from the new Novyy Lipetsk rolling mills will be diverted to military use. [redacted] 25X1

25X1

When Oskol is completed, the complex will produce steel products that have a variety of applications. [redacted] the West German–built rolling mill will produce standard large steel sections. These sections probably will be in the form of bars for use in construction and machinery, axles for cars and trucks, torsion bars for armored vehicles, and beams for ships. We believe the Zhlobin steel products will have similar end uses. The Soviets report that the Oskol mill will also produce semifinished pipe. This probably will be used to make mechanical service pipe used in construction and pressure tubes for boilers. The type of production that might be expected from the other section mills planned at Oskol includes beams used in the construction of buildings, machines, and ships. Production from the plate mill planned for the final construction stage has applications in the production of machines, ships, armored vehicles, and large-diameter pipe. Because of the high quality of steel produced using the direct-reduction process, we believe that some of the rolled steel will be used in military production. [redacted] 25X1

25X1 25X1 25X1 25X1 25X1

Trade

Shortfalls in domestic steel production have led Soviet planners to increase markedly their imports of many steel products from the West. In 1970 the Soviet Union was a net exporter of steel, but by the late 1970s imports and exports were roughly in balance—about 7 million tons each. In 1982 the Soviets spent over $5 billion on steel purchases; 60 percent went for pipe and 40 percent for rolled products.[12] The USSR is especially dependent on imports of cold-rolled steel sheet and large-diameter pipe. The Soviets also import steel plate and sections, as well as tin plate for canning and packaging. [redacted]

25X1 25X1 25X1 25X1 25X1 25X1

[redacted]

25X1 25X1

25X1

When the Novyy Lipetsk rolling mills, the total Oskol complex, and the Zhlobin minimill are fully operational—probably not before the mid-1990s—the Soviets may be able to reduce, if not eliminate, purchases of many types of Western steel, especially cold-rolled sheet and section steel. The Soviets have indicated that the entire production from the Novyy Lipetsk dynamo facility will be consumed domestically, eliminating the need for imports. If plate from the Oskol complex is used for large-diameter pipe, further reductions in imports can be expected.

Substantial hard currency savings can be expected with this reduction of steel imports. For instance, although we do not know how much cold-rolled steel sheet is imported, the cost on the world market of the 2.5 million tons of sheet to be produced annually at the Novyy Lipetsk sheet mill is about 40 percent of Soviet expenditures for imports of all rolled steel products in recent years (about $840 million annually).[13] We believe that hard currency savings from the production at Novyy Lipetsk, Oskol, and Zhlobin will start during 1986-90. Because the USSR probably will not be able to increase hard currency imports substantially in the second half of the decade without a sizable increase in credits, a cut in its steel imports would help its balance-of-payments position.

Resource Savings

The Soviets are planning a 50-percent increase in electric furnace capacity during 1981-85 in an effort to modernize their steelmaking capacity. Every 10 tons of steel produced in a conventional electric furnace, however, requires about 1 ton of coking coal and 11 tons of scrap—resources that are subject to supply interruptions in the USSR. Though the USSR has enormous reserves of coking coal—65-70 billion tons—production has stagnated since 1976. Similarly, localized scrap shortages have occurred in the USSR because of limited equipment to sort scrap metal, shortages of labor, and poor coordination of scrap collection. The limited availability of scrap metal probably has slowed the pace at which the Soviets can install new electric furnace capacity. The direct-reduction process that will be used at the Oskol complex for electric steelmaking uses no coking coal and little scrap.

The direct-reduction process does require a steady supply of some resources—iron ore, natural gas for the reduction of iron pellets, and electricity. The Soviet steel industry as a whole is currently faced with a leveling off of iron ore production due to mine depletion and declining ore grades. Soviet data suggest that about three-fourths of annual gross additions of new iron ore capacity now simply offset mine depletion in older basins. Meanwhile, the average ferrous content of working deposits declined from about 50 percent in 1950 to 44 percent in 1975 and 35 percent in 1980. Because of the steady fall in ore quality, the Soviets have had to divert increasing amounts of investment to building beneficiating facilities. Almost nine-tenths of Soviet iron ore must now be enriched compared with only one-third in the late 1950s. About 70 percent of investment in the iron ore sector currently is going into beneficiating facilities. Consequently, there are fewer rubles left for construction of new mines and modernization of older facilities. The Soviets need to guarantee a steady supply of iron ore—by increasing production, trimming exports to Eastern Europe, or boosting imports—in order to expand use of direct-reduction technology beyond that planned for Oskol.

Outlook for Diffusion of Direct-Reduction Technology

The Soviets have promoted the idea of using the direct-reduction process in conjunction with minimills to reduce capital investment requirements and shorten construction times.[14] This idea is particularly attractive because:

- The capital investment required to achieve a 1-ton increment in steel production has grown sharply at large-capacity steel facilities. real capital investment per ton of additional crude steel increased from 431 rubles during 1966-70 to 761 rubles during 1976-80.

[13] Prices for a metric ton of cold-rolled sheet and galvanized sheet were taken from the 2 March 1984 issue of *Metal Bulletin*, multiplied by the expected production at Novyy Lipetsk, then totaled. This value was divided by the average dollar value of all Soviet rolled steel imports for 1978-82 as reported in *Vneshnyaya torgovlya* to arrive at this percentage figure.

[14] Minimills can use either scrap and/or directly reduced iron pellets as the principal feedstock for steelmaking.

- Construction periods and timetables for commissioning the huge blast furnaces, converters, and rolling mills have increased substantially. For instance, construction of a blast furnace with a designed annual capacity of 4.5 million tons of pig iron began at Cherepovets in 1981. [redacted] 25X1
[redacted] the furnace was still in the beginning stages of construction in early 1984. 25X1

Minimills offer flexibility because they require less capital than larger facilities, and the mills can be built more rapidly to meet demands for specific nonflat rolled steel products. Moreover, the Soviets have indicated that they may build minimills based on the direct-reduction process as a means of meeting the iron and steel needs of the Soviet Far East and eastern Siberia—areas where scrap metal and coke are in short supply. [redacted] 25X1

We believe that the Soviets will not be able to incorporate the direct-reduction technology in Soviet-produced equipment for use at other plants for several years. Historically, the Soviets have been slow in diffusing Western technology.[15] Soviet research and development work often does not begin until assimilation of imported plant and equipment is well under way or has been completed. The Soviets would require years of developmental work to duplicate Western direct-reduction technology. Thus, if they intend to build new direct-reduction plants within the next decade, they probably will have to rely on continued imports of Western technology and equipment. [redacted] 25X1

[redacted] 25X1